Forest Pest Management

Pacific Southwest Region

Lat 39.17563 Lon -120.52858

July 17, 2000
File Code: 3420

To: District Ranger, Foresthill RD, Tahoe NF
Subject: Divide and Screwauger Underburns (NE00 - 14)

At the request of Gail Parn, I conducted a field evaluation of two underburns on June 22, 2000. Gail Parn and Jerry Westfall accompanied me in the field. The objectives of the field visit were to assess the level of bark beetle activity following the underburns, discuss the influence of the attacks on tree survival, and to provide suggestions on reducing the fire-related damage to the conifers. The underburns were along the Foresthill Divide Rd. and in the area between Antoine and Screwauger canyons.

Divide Underburn

The Divide underburn area encompasses approximately 1,600 acres and is adjacent to the Foresthill Divide road. The stands are part of the Volcano plantation that was established following a stand replacing fire. The burn units consist of an even-aged sheltered canopy of ponderosa pine with pockets of black oak. The objective of the underburn is to reduce the potential for catastrophic fire by removing the buildup of live and dead understory fuel, woody debris and duff by 50-75%. In addition, underburning in areas of dense manzanita and deer brush would create a mosaic of different age classes of brush to provide cover and browse for wildlife. Mortality of trees >10 inches DBH was not to exceed 15%. Prior to underburning the units were thinned with a masticating type machine to reduce ladder fuels. The chips were left on site to be burned. The project is being conducted through a series of underburns during the spring, fall and winter. (Prescribed fire plan, 10-01-99).

We examined three areas: two of which were burned in early November 1999, and the remaining area was burned May 1, 2000. In many areas along the road the fire consumed whole trees and significant portions of the crowns on several additional trees. Ponderosa pines can survive a significant amount of crown damage. In his guidelines for estimating survival of fire-damaged trees in California (U.S. Forest Service, Pacific Southwest Forest and Range Experiment Station, 1961, Misc. Paper 60) Willis Wagener states that ponderosa pines can tolerate up to 90%

NORTHEASTERN CALIFORNIA SHARED SERVICE AREA
2550 RIVERSIDE DRIVE
SUSANVILLE, CA 96130

Sheri Lee Smith
Supervisory Entomologist
530-252-6667
E-mail: ssmith@fs.fed.us

foliage scorch, provided that twigs and buds survive within at least 50% of the prefire live crown. For other species, such as sugar pine, true firs, Douglas fir and incense cedar, foliage scorch can occur on up to 65% of the crown before survival is compromised assuming cambium damage is not severe. The survival criteria above are based on late season fires. For early season fires he uses a criteria of 35% or more green foliage and does not distinguish between species.

Another inportant factor regarding survival of trees that have sustained fire injuries is the amount of cambium damage. I examined the cambium at ground level and up about 6 inches above the ground surface on several trees and found that the fire had been hot enough or of long enough duration to kill the cambium in excess of 75% of the circumference of the trees and on some of the trees the cambium around the entire circumference of the bole was killed. The survival criteria for cambium damage is < 25% of the bole circumference on individual trees (Wagener, 1961). Weatherspoon ((1987) indicates that conifers can survive up to 40% cambium damage when crown scorch is light or absent.

Based on the above survival criteria additional mortality related to the fire injuries can be expected in areas where the fire was hot enough to burn significant portions of the cambium or in areas where the residual tree crown is not sufficient to sustain the tree. For future underburns conducted in areas that are masticated it may be necessary to pull some of the chips away from the bases of the trees the District desires to maintain as residuals or allow enough time between the mastication and the underburn to allow the chipped material to decompose enough to alter the flammability and heat intensity.

Several of the ponderosa pines I examined throughout the 1999 and 2000 Divide underburns have numerous red turpentine beetle (RTB), *Dendroctonus valens*, attacks. No other *Dendroctonus* sp. (ie. western pine beetle or mountain pine beetle) were present. The RTB attacks occurred this spring and summer and are primarily located in areas where there is bark scorch and/or cambium damage from the fire. The red turpentine beetle normally attacks injured, weakened or dying trees and freshly cut stumps. The adults are attracted by fresh pine resin. In the Divide underburn the red turpentine beetles were attracted to trees with fire-related injuries. A beetle-produced aggregation pheromone is also important in attracting additional beetles into suitable hosts. Attacks usually occur at the soil line or root crown and are characterized by a large reddish pitch tube at the point of entry. If an attack is successful, the adults excavate an irregular gallery in the cambium and the female lays eggs along the sides.Attacks usually do not kill trees but may predispose them to attack by other bark beetles. Little can be done to control red turpentine beetles once they are beneath the bark. Good health and vigor in a tree and minimizing fire-related injuries are the best protection against infestation. The feeding activity of the adult beetles and their larval offspring kills a limited amount of living tissue. If enough beetles attack a tree so that feeding areas overlap the tree will die as a consequence of the girdling.

Over the past three years elevated levels of red turpentine beetle activity has been noted in several areas in northeastern California including earlier RTB activity following an underburn in the Volcano plantation in 1997 (See FPM Report #NE98-8). All cases have been associated with wildfires, prescribed fires or thinning activities. To date, these attacks have not caused elevated levels of mortality. In the prescribed fires and wildfires, post-fire mortality has been observed, but was caused by fire-related injuries (primarily cambium kill) as opposed to bark beetle attacks. FPM personnel have been monitoring 50 Jeffrey and ponderosa pine trees on the Lassen NF that were attacked by RTB following a thinning in 1995. The number of attacks on these trees ranged from 2 to 100+ and were found up to 15 ft. up the bole. To date, two trees have died. Based on this information, observations following other fires, and the moist precipitation

pattern over the past four years, I would anticipate a minimal amount of mortality related to the red turpentine beetle attacks.

Observations over the past few years indicate that some level of red turpentine beetle activity should be expected following underburns. Monitoring is ongoing in several areas to determine what level, if any, of mortality should be expected associated with these or other bark beetle attacks following prescribed fire. The level of bark beetle activity may be dependent upon the season, intensity and duration of the burn, the precipitation regime, stand characteristics, and the ongoing bark beetle activity in the general area prior to the burn. In addition to the ongoing monitoring, FPM established several individual trees to monitor in the Divide underburns. We are monitoring for survivability following fire-related injuries and bark beetle attacks. Trees have been tagged and numbered in both the spring and fall burn areas. A report summarizing the initial data will be forthcoming. **Please contact FPM personnel before felling or removing any of the study trees.**

Screwauger Underburn

The Screwauger Analysis area is approximately 4,270 acres of which approximately 811 acres are planned for underburns. The objectives of the underburn are to reduce fuel hazards and improve timber stands and wildlife habitat. To meet their objectives for this project, the District planned a series of underburns in eleven units. We looked at the condition in Unit 2 which was underburned in early June 1999. This unit consisted of an open canopy of large pines and mixed conifer species with pockets of reproduction. The understory vegetation was characterized by pinemat manzanita, huckleberry oak and tan oak. For Unit 2, the goal of the underburn was to reduce the amount and continuity of understory fuel by 25-50% while keeping the mortality of trees >10" DBH to less than 15%.

During the spring of 2000, District personnel observed several large sugar pines dying within Unit 2 and were concerned that the mortality was associated with the underburn. I examined several of the dying sugar pines within the underburn and a few additional dying ones that were across the road in an unburned area. The large trees that I examined would have been expected to survive their fire-related injuries based on very little crown and/or cambium damage. However, all of the dying trees were successfully attacked by mountain pine beetle (MPB), *Dendroctonus ponderosae*, during 1999. In addition, a clump of sugar pine regeneration that I examined, which was mostly killed outright during the underburn, had a few remaining green trees that were under current attack by mountain pine beetle.

The mountain pine beetle attacks the bole of ponderosa, lodgepole, sugar and western white pines larger than about 8" DBH. Group killing often occurs in mature forests and young overstocked stands. The first sign of beetle-caused mortality is generally discolored foliage. Examination of infested trees usually reveals the presence of pitch tubes. Pitch tubes on successfully infested trees are pink to dark red masses of resin mixed with boring dust. Creamy, white pitch tubes indicate that the tree was able to "pitch out" the beetle and the attack was not successful. The beetle develops through four stages: egg, larva, pupa and adult. The life cycle of the mountain pine beetle varies considerably over its range. One generation per year is the general rule, with attacks occurring from late June through August. Two generations per year may develop in low elevation sugar pine. The adults bore long vertical egg galleries and lay eggs in niches along the

sides of the gallery. The larvae feed in mines perpendicular to the main gallery and construct small pupal cells at the end of these mines where they pupate and transform into adults.

Based on observations of the sugar pine mortality within and around the area of the Screwauger burn, including single, large, sugar pines dying in adjacent drainages, it appears as though mountain pine beetle activity in sugar pine is increasing compared to the level of mortality that has been detected over the past few years. Based on mortality occurring in burned and unburned areas the direct cause of the mountain pine beetle attacks in the sugar pines in Unit 2 cannot be solely attributed to the underburn; however, it is known that mountain pine beetles are attracted to wounded sugar pines and the underburn may have provided an opportunity for the beetles to cause "group" kills of the larger pines here where in other underburned areas only an individual tree here and there is being killed.

I have been observing mortality of large diameter, single, ponderosa and Jeffrey pine trees throughout several areas in northeastern California this year. Although it is anticipated that the bark beetle populations are low, as evidenced by very low levels of pine mortality detected over the past few years, it is clear that the endemic level of bark beetles associated with pine species are finding suitable host material in the large, old, slow-growing trees which is not atypical of what would be expected. The greater concern in the area of Unit 2 that we observed, may be the loss, primarily due to fire, of the understory sugar pines that would provide the overstory and large tree component in the future. Although it would not be my recommendation at this time to not continue with the underburns in the Screwauger area, it should be noted that mountain pine beetle-related mortality in sugar pine is increasing and this should be taken into consideration when sugar pines are part of the stand component of an area planned for underburns.

If you have any questions regarding this report or request additional assistance please contact me at (530) 252-6667 or at ssmith@fs.fed.us.

Sheri Lee Smith
Supervisory Entomologist
Forest Pest Management
NE CA Shared Service Area